Old Woman Creek (OWC) NERR Site Water Quality Metadata
March through December, 2004
Latest Update: October 31, 2005

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2. Research Objectives:

Samples for chemical analysis are taken monthly at the four existing datalogger sites within or near the Old Woman Creek SNP and NERR. Three of the sites are in the estuary proper- one in the upper reaches at State Route 2 (SU) one near the mouth, just south of State Route 6 (WM) and the third site is upstream from the WM site (OL). The final site (BR) is just upstream of the first riffle zone above the estuary in Old Woman Creek proper. The purpose of this part of the nutrient monitoring program is to document the spatial and temporal distribution of nutrient levels in this Great Lakes estuary.

At site WM samples are collected at 2 hour intervals over a 26 hour period once a month. The purpose of this part of the monitoring program is to examine temporal changes in nutrient levels in the estuary over the course of a day.

3. Research methods:

Monthly Sampling

The chemical monitoring program began on 8 March, 2004 at sites BR, SU, OL, and WM. The sampling at all sites ended for the year on 16 December, 2004, except site OL, which ended on 29 November, 2004.

Replicate grab samples for chemical and chlorophyll analysis were collected sequentially at each of the data logger sites each time the data loggers were swapped out. The samples were collected immediately prior to changing the data loggers, insuring that the samples for chemical analysis were undisturbed.

Sample bottles, (previously washed with 10% HCl, rinsed six (6) times with distilled water and then allowed to air dry upside down prior to sampling), were rinsed with the sample water three times before the sample was collected for analysis. Temperature, dissolved oxygen, and pH values were determined on the samples at time of collection using field meters that were previously calibrated according to the manufacturer. If samples were not to be filtered and analyzed within the next hour or so, they were stored in a refrigerator or in the dark on ice.

Diurnal Sampling

Once a month- from March through December, 2004- samples were collected at site WM at two hour intervals for a 26 hour period using an ISCO Model 3700 FR refrigerated sampler. At each 2-hour interval, the sampler collected a single 800 ml sample. Prior to collecting each sample, the ISCO sampler was programmed to rinse the collection line three times. The diurnal samples were collected within one meter of the datalogger and at the same depth. The sample bottles for the sampler were cleaned using the same protocol outlined above.

4. Site Location and Character:

Old Woman Creek National Estuarine Research Reserve is located on the southern shore of Lake Erie, slightly east of the city of Huron, Ohio (Latitude 41° 23'N; Longitude 82° 33'W). Land use in the Old Woman Creek (OWC) watershed is primarily row crop agriculture. Salinity in Old Woman Creek is normally 1 ppt. or less.

The data logger at the State Route 6 (WM) site (Latitude 41° 22' 57" N, Longitude 82° 30'54" W) is very close to the mouth of Old Woman Creek. In this portion of the Reserve, the creek is very shallow but extends over a large surface area. This site frequently experiences influx of Lake Erie waters. The bottom sediments at this site are silty clay. There was no rooted aquatic vegetation directly adjacent to the site, although there was both emergent and submerged vegetation within 3 meters of the site. *Phragmites australis* is the dominant aquatic macrophyte near this site.

The data logger at the State Route 2 (SU) site (Latitude 41° 22' 2" N, Longitude 82° 30'26" W) is very near the southern boundary of the Reserve. This site is in the upper reaches of the estuary. The site is located near a concrete piling of the eastbound Ohio State Route 2 bridge. At this site, the creek is relatively deep and narrow. Although water direction and flow is influenced at this site by changes in Lake Erie water levels, this site doesn't have direct contact with Lake Erie waters. The bottom sediments at this site are silty clay. There is no rooted aquatic vegetation near or upstream from this site.

The data logger at site OL (Latitude 41^0 22' 55" N, Longitude 82^0 30'51" W) is in the lower reaches of the estuary. This site is not in direct sight of the mouth, so northerly winds and resulting seiche activities should be less noticeable at this site. The

bottom sediments are silty clay. This site is located near the northern tip of a *Nelumbo lutea* bed, but there are plants are immediately adjacent to the site.

The data logger at site BR (Latitude 41^0 20'54" N, Longitude 82^0 30'30"W) is located in the lower portion of the creek proper. Just upstream from the data logger, Berlin Road crosses Old Woman Creek. The site is just upstream of the first riffle area above the estuary. Unlike the other three sites, Lake Erie water levels have no impact on this site. The bottom of the creek at this site is a combination of rocks interspersed with clay-silt that has been washed in from upstream. There are no aquatic macrophytes at or near this site.

5. Code variable definitions

OWC- Old Woman Creek; SU- State Route 2; WM- State Route 6; OL- site in lower estuary above site WM; BR- Berlin Road site; NUT- nutrient sample;

6. Sample Collection Periods

Sampling at WM began on March 8, 2004 at 09:30. Sampling for 2003 ceased at WM site on December 16, 2004 at 10:00. Sampling at SU began on March 8, 2004 at 10:15. Sampling ceased at SU site on December 16, 2004 at 08:45. Sampling at OL began on March 8, 2004 at 09:15, and ceased on November 29, 2004 at 10:15. Sampling at BR began on March 8, 2004 at 10:30 and ceased on December 16, 2004 at 09:15. Specific deployment dates are listed below. **Note:** All times given are in Eastern Standard Time. The two grab samples were collected sequentially and within 30-60 seconds of each other.

Collection times:

Site WM

03/08/2004 (09:30:00)
03/29/2004 (09:45:00)
04/19/2004 (08:15:00)
05/10/2004 (08:30:00)
06/01/2004 (08:15:00)
06/21/2004 (08:45:00)
07/06/2004 (08:45:00)
07/26/2004 (09:15:00)
08/09/2004 (08:15:00)
08/23/2004 (08:15:00)
09/07/2004 (08:15:00)
09/20/2004 (08:30:00)
10/05/2004 (08:15:00)
10/25/2004 (07:45:00)
11/08/2004 (10:15:00)
11/29/2004 (10:15:00)

12/16/2004 (10:00:00)

SU

03/08/2004 (10:15:00)
03/29/2004 (08:30:00)
04/19/2004 (07:15:00)
05/10/2004 (07:45:00)
06/01/2004 (07:15:00)
06/21/2004 (07:30:00)
07/06/2004 (07:45:00)
07/26/2004 (08:15:00)
08/09/2004 (07:15:00)
08/23/2004 (07:15:00)
09/07/2004 (07:30:00)
09/20/2004 (07:45:00)
10/05/2004 (07:30:00)
10/25/2004 (08:45:00)
11/08/2004 (08:45:00)
11/29/2004 (09:15:00)
12/16/2004 (08:45:00)

OL

03/08/2004 (09:15:00)
03/29/2004 (09:30:00)
04/19/2004 (08:00:00)
05/10/2004 (08:30:00)
06/01/2004 (08:30:00)
06/21/2004 (08:45:00)
07/06/2004 (08:45:00)
07/26/2004 (09:00:00)
08/09/2004 (08:15:00)
08/23/2004 (08:15:00)
09/07/2004 (08:45:00)
09/20/2004 (08:30:00)
10/05/2004 (08:15:00)
10/25/2004 (07:45:00)
11/08/2004 (10:30:00)
11/29/2004 (10:15:00)

BR

03/08/2004 (10:30:00)
03/29/2004 (09:00:00)
04/19/2004 (07:30:00)
05/10/2004 (07:45:00)
06/01/2004 (07:45:00)
06/21/2004 (07:45:00)

07/06/2004 (08:00:00)
07/26/2004 (08:45:00)
08/09/2004 (07:45:00)
08/23/2004 (07:45:00)
09/07/2004 (07:45:00)
09/20/2004 (08:00:00)
10/05/2004 (07:45:00)
10/25/2004 (09:00:00)
11/08/2004 (09:15:00)
11/29/2004 (09:45:00)
12/16/2004 (09:15:00)

Diurnal Sampling Periods

Samples were collected at site WM at two hour intervals for the diurnal portion of the nutrient study at the following times:

beginning at:	and ending at:
03/14/2004 (04:00:00)	03/15/2004 (06:00:00)
04/11/2004 (04:00:00)	04/12/2004 (06:00:00)
05/16/2004 (06:00:00)	05/17/2004 (08:00:00)
06/6/2004 (04:00:00)	06/07/2004 (06:00:00)
07/11/2004 (04:00:00)	07/12/2004 (06:00:00)
08/15/2004 (04:00:00)	08/16/2004 (06:00:00)
09/12/2004 (04:00:00)	09/13/2004 (06:00:00)
10/10/2004 (04:00:00)	10/11/2004 (06:00:00)
11/14/2004 (04:00:00)	11/15/2004 (06:00:00)
12/12/2004 (04:00:00)	12/13/2004 (06:00:00)

7. Associated projects:

Dataloggers are deployed at each of the nutrient sampling sites. These loggers are taking readings of water temperature, specific conductivity, dissolved oxygen, pH, turbidity, and depth at 15-minute intervals. Samples for phytoplankton determination are collected at the same time at two sites near the data logger deployment sites WM and SU. The chemical data have been incorporated into several research projects, including a study on the plankton eukaryotic microorganisms, a study on the breakdown of selected organic contaminants, a study on the impacts of *Phragmites* control on non target communities, and a biomonitoring pilot study on the aquatic vegetation of the estuary.

8. Distribution

NOAA/ERD retains the right to analyze, synthesize, and publish summaries of the NERRS System-wide Monitoring Program data. The OWC Research Coordinator (RC) retains the right to be fully credited for having collected and processed the data. Following academic courtesy standard, the RC and the NERR site where the data were collected will be contacted and fully acknowledged in any subsequent publications in which any part of the data are used.

The data set enclosed within this package/transmission is only as good as the quality assurance and quality control procedures outlined in the enclosed metadata reporting statement. The user bears all responsibility for its subsequent use/misuse in any further analyses or comparisons. The Federal government and the State of Ohio do not assume liability to the Recipient or third persons, nor will the Federal government or the State of Ohio reimburse or indemnify the Recipient for its liability due to any losses resulting in any way from the use of this data.

NERR water quality data and metadata can be obtained from the Research Coordinator at the individual NERR site (please see section 1. Principal investigators and contact persons), from the Data Manager at the Centralized Data Management Office (please see personnel directory under general information link on CDMO homepage) an online at the CDMO homepage http://cdmo.baruch.sc.edu/. Data are available in text tab-delimited format, Microsoft Excel spreadsheet format, and comma-delimited format from the CDMO.

9. Entry Verification

All chemical test results collected in the laboratory for one set of samples are recorded on a datasheet. As well as the results from the various chemical tests, this sheet includes data collected in the field (temp, pH, dissolved oxygen) and the time of sample collection. In addition, any anomalies observed in the field or in the lab are also recorded on this worksheet. The worksheet is kept on file in the research coordinator's office.

The data collected on the various worksheets are then transferred to an excel spreadsheet by the office assistant. The research coordinator verifies the values on the spreadsheet by comparing with the original worksheets. The research coordinator verifies missing data and marks such data with a " ". The data is also compared to determined MDL data and any data below the calculated MDL is denoted with "-9999" and marked with a B in the comments column, as are any affected calculated values. Duplicate readings are visually inspected to identify any outliers, which would suggest either testing or contamination problems. The research coordinator is responsible for the QA/QC both in entry verification and in nutrient analysis.

10.Parameter Titles and Variable Names by Data Category

Data Category	Parameter	Variable Name	Unit of Measure
Phosphorus	Soluble Reactive Phosphorus (Orthophosphate)	SRP (PO4F)	mg/l as P
Nitrogen	Nitrite + Nitrate, Filtered	NO23	mg/l as N
	Nitrite, Filtered	NO2	mg/l as N
	Nitrate, Filtered	NO3	mg/l as N

	Ammonium, Filtered	NH4	mg/l as N
	Dissolved Inorganic Nitrogen	DIN	mg/l as N
Chlorophyll	Chlorophyll a	CHLA	µg/l

11. Measured and Calculated Laboratory Parameters

a.Variables Measured Directly

Phosphorus Species: SRP
Nitrogen Species: NH_4, NO_{2+3}, NO_2
Chlorophyll Species: CHLA, PHEA

b.Computed Variables

Nitrogen Species: NO_3 (NO_{2+3}-NO_2); and DIN (NO_{2+3} and NH_4)

12. Limits of Detection

The Minimum Detection Limits (MDL), the lowest concentration of a parameter that an analytical procedure can reliably detect, have been established by the Old Woman Creek Analytical Laboratory. The MDL is determined as 3 times the standard deviation of a minimum of 7 replicates of a single low concentration sample. The table below presents the current MDL's. These values are reviewed and revised annually.

Parameter	Variable	Mean Conc. mg/l as N or P	Std. Dev.	MDL mg/l as N or P	Dates in use
Ammonia	NH4	.039	.0051	.015	3/2004-12/2004
Nitrate + Nitrite	NO23	.201	.0036	.011	3/2004-12/2004
Nitrite	NO2	.040	.00023	.0007	3/2004-12/2004
Soluble Reactive Phosphate	SRP	.074	.00033	.0010	3/2004-12/2004

13. Laboratory Methods

Upon returning to the laboratory, each bottle was shaken and a 100 ml sub-sample for total P and metals (stored in a plastic bottle and preserved with 1 ml 10% HCl) and a 25 ml sub-sample for alkalinity determination were removed. Also prior to filtering, turbidity and conductivity were determined using laboratory meters. Samples for chemical and chlorophyll analysis were filtered as quickly as possible using an aspirator/vacuum system.

Samples for chlorophyll analysis: A sample of known volume (for chlorophyll analysis) was filtered through a Gelman 47 mm diameter A/E filter (1 micron). The filter was then removed, folded, cut into small pieces, and then placed into 10 ml. aqueous acetone (90% acetone, 10% saturated magnesium carbonate solution) in a 100 ml glass-

stoppered bottle and stored in the freezer in the dark until analysis was conducted one week later. The procedure for chlorophyll analysis is described in Standard Methods for the Analysis of Water and Wastewater, 19th Edn. (1995) (Standard Methods) under "Spectrophotometric Determination of Chlorophyll", page 10-18.

Samples for chemical analysis: After filtration for chlorophyll analysis, the water used for chemical analysis was then filtered through a 47 mm diameter membrane filter (.45 micron) that had been prepared by soaking in distilled water as outlined in Standard Methods. The chemical procedures used were from Standard Methods:

a) Parameter Ammonia:

Standard Methods Reference: 4500-NH_3 Phenate Method page 4-80
Old Woman Creek SOP- ammonia test
Preservation method: none- tested within 12 hours of collection

b) Parameter Nitrite:

Standard Methods Reference: 4500-NO_2 Colorimetric Method page 4-83
Old Woman Creek SOP- nitrite test
Preservation method: none- tested within 12 hours of collection

c) Parameter Nitrate:

Standard Methods Reference: 4500-NO_3 Cadmium Reduction Method page 4-87
Old Woman Creek SOP- nitrate test
Preservation method: none- tested within 12 hours of collection

d) Parameter Phosphorus (soluble reactive phosphorus):

Standard Methods Reference: 4500-P Ascorbic Acid Method page 4-113
Old Woman Creek SOP- Soluble reactive phosphorus test
Preservation method: none- tested within 12 hours of collection

The compete protocol used in both the chlorophyll and chemical analysis of the water is detailed in the Old Woman Creek Standard Operating Procedures Manual (2003).

14. Reporting Missing Data and Data with Concentrations lower than Minimum Detection Limits

Nutrient/Chla comment codes and definitions are provided in the table at the end of this section. Missing data are denoted by a blank cell and comment coded "M" in the variable code comment column. Laboratories in the NERRS System submit data that are censored at a lower detection rate limit, called the Minimum Detection Limit. MDL's for the specific parameters are listed above. Concentrations that are less than this limit are denoted by a "–9999" and comment coded with a "B" in the variable code comment column. For example, if the reported concentration for NO23 was 0.005 mg/l and the MDL was 0.016 mg/l, the reported value would be –9999 and a "B" placed in the comment code column. Calculated parameters are comment coded with a "C". If any of the components used in the calculation are below the MDL, the calculated variable is

denoted by –9999 and also comment coded with a "B". . If a calculated value is negative, the value is reported as a "-9999" and comment coded "N".

Comment Code	Definition
A	Value above upper limit of detection method
B	Value below minimum detection limit
C	Calculated value
D	Data deleted or calculated value could not be determined due to deleted data, see meta data section #17 (other remarks) for details
H	Sample held beyond specified hold time
K	Check metadata section #17 (other remarks) for details
M	Data missing, sample not collected ; calculated value could not be determined due to missing data
N	Negative calculated value
P	Significant precipitation see metadata section #17 (other remarks) for details
U	Lab analysis from unpreserved samples
S	Data suspect, see metadata for further details

Missing data- Data was not collected in the diurnal sampling on 3/14/2004 at both 04:00 and at 22:00 because the sampling hose was out of the water.

Data was not collected in the grab samples for site OL during December 16, 2004 as the site was surrounded by ice and could not be sampled safely.

Deleted data- The following data was below minimum detection limits and the data was replaced with a -9999:

Ammonia: Monthly grab samples- BR 3/8/2004 (rep 2);
BR 3/29/2004 (rep 2)
BR 10/25/2004 (rep 2)
Diurnal samples (WM)- 06/06/2004- 16:00; 18:00; 20:00
07/11/2004- 12:00; 14:00; 16:00; 22:00
07/12/2004- 00:00
08/15/2004- 14:00; 16:00; 18:00

Nitrate: Diurnal samples (WM)- 7/11/2004- 14:00

Pheophyton: monthly grab samples- BR 10/25/2004 (rep 2);
SU 11/08/2004 (rep1);
BR 11/08/2004 (rep 2);
SU 11/29/2004 (rep 1);
BR 11/29/2004 (rep 1);
SU 12/16/2004 (reps 1 and 2);
BR 12/16/2004 (rep 1)

15. QA/QC Programs

a) Precision

Field Variability- In the SWMP Monitoring program, two replicate samples are collected at all four of the data logger sites. These samples are collected consecutively.

Laboratory Variability- At Old Woman Creek two of the 8 samples (25%) are duplicated in the chemical testing program to determine the variability in the chemical methods.

Inter-organizational Splits- Old Woman Creek SNP and NERR does not participate in an inter-organizational split program with any other lab.

a) Accuracy

Sample Spikes- Spikes on conducted on a sub-sample of one of the duplicate sample every third sampling time.

Standard Reference Material Analysis- Two standard reference Material analysess was conducted at the Old Woman Creek laboratory, once in the Spring and once in the Autumn. The information is below:

Table 1. Results of the SRM analysis for OWC NERR.

	NH4-N (mg/L)	NO3-N (mg/L)	NO2-N (mg/L)	PO4-P (mg/L)	Total P (mg/L)	SRP treated as TP
Certified conc.	0.420	2.14	2.73	0.656	..541	
OWC rep #1(Spring)	0.454	2.41	2.639	0.493	0.506	
OWC rep #2 (Spring)	0.472	2.5	2.631	0.49	0.508	
Acceptable limits	0.230 - 0.620	1.68 - 2.60	2.12-3.34	0.542 - 0.770	.407-.675	

Fall Certified Conc	0.42	0.214	2.73	0.657	0.541	0.657
OWC rep #1	0.346	2.31	2.406	0.5692	0.4845	0.6125
OWC rep #2	0.366	2.27	2.411	0.5684	0.4973	0.6045
Acceptable limits	.230-.620	1.68-2.60	2.12-3.34	.543-.771	0.407-.675	.542-.770

In addition, a standard of known concentration is analyzed each week along with the regular field samples. If the standard varies by more than 5% from the stand curve, the standard curve is recalibrated with new standards.

Cross Calibration Exercises- Old Woman Creek SNP and NERR did not participate in any cross calibration exercises with other labs during 2004

16. Other Remarks:

Daily(Rainfall in mm/day)

Date	TotPrcp
03/02/2004	02.8
03/03/2004	00.5
03/04/2004	00.8
03/05/2004	12.7
03/06/2004	01.3
03/08/2004	02.0
03/09/2004	00.3
03/10/2004	00.5
03/12/2004	00.5
03/15/2004	01.3
03/17/2004	01.8
03/18/2004	00.5
03/19/2004	01.8
03/21/2004	12.2
03/22/2004	00.5
03/25/2004	08.4
03/26/2004	03.6
03/27/2004	07.9
03/30/2004	13.2
03/31/2004	18.0
04/01/2004	05.3
04/02/2004	12.2
04/03/2004	06.1
04/04/2004	03.0
04/08/2004	04.6
04/12/2004	05.3
04/13/2004	05.8
04/17/2004	05.8
04/21/2004	01.5
04/22/2004	01.3
04/23/2004	00.3
04/25/2004	06.1
04/27/2004	01.3
04/30/2004	05.3
05/01/2004	10.2
05/02/2004	21.8
05/07/2004	00.3
05/08/2004	08.9
05/10/2004	00.8
05/11/2004	01.0
05/12/2004	08.4
05/14/2004	01.3
05/15/2004	03.0
05/16/2004	04.6
05/18/2004	03.3

05/19/2004	12.7
05/20/2004	00.8
05/21/2004	29.0
05/22/2004	44.7
05/23/2004	08.4
05/24/2004	04.1
05/28/2004	09.4
05/31/2004	15.2
06/01/2004	01.5
06/02/2004	02.5
06/03/2004	02.5
06/10/2004	07.4
06/11/2004	25.4
06/12/2004	14.2
06/13/2004	03.6
06/14/2004	08.6
06/15/2004	15.7
06/16/2004	00.3
06/17/2004	00.5
06/18/2004	06.9
06/20/2004	00.3
06/23/2004	00.5
06/26/2004	14.0
06/29/2004	22.1
06/30/2004	00.3
07/05/2004	07.6
07/12/2004	00.3
07/13/2004	02.8
07/14/2004	00.0
07/15/2004	07.9
07/16/2004	00.0
07/17/2004	04.3
07/18/2004	20.1
07/19/2004	02.0
07/22/2004	01.0
07/23/2004	03.3
07/27/2004	05.3
07/28/2004	03.6
07/29/2004	00.3
07/31/2004	41.1
08/01/2004	02.8
08/02/2004	00.3
08/05/2004	15.5
08/17/2004	00.3
08/18/2004	02.3
08/19/2004	12.4
08/20/2004	17.3
08/21/2004	09.1
08/22/2004	00.3
08/28/2004	04.1

08/29/2004	07.4
08/30/2004	06.6
09/01/2004	00.3
09/06/2004	00.3
09/09/2004	29.0
09/11/2004	00.3
09/13/2004	00.3
09/17/2004	01.5
09/18/2004	01.8
09/23/2004	00.3
09/25/2004	00.3
09/29/2004	00.3
10/02/2004	00.3
10/03/2004	02.8
10/04/2004	00.3
10/14/2004	05.6
10/15/2004	00.3
10/16/2004	17.3
10/19/2004	07.6
10/24/2004	07.1
10/26/2004	00.3
10/29/2004	10.7
11/02/2004	18.8
11/04/2004	09.7
11/16/2004	02.5
11/17/2004	04.3
11/18/2004	00.3
11/19/2004	09.9
11/20/2004	00.8
11/24/2004	21.6
11/25/2004	02.0
11/26/2004	00.5
11/27/2004	00.3
11/28/2004	01.8
11/29/2004	00.8
11/30/2004	15.0
12/01/2004	02.3
12/06/2004	02.8
12/07/2004	04.6
12/09/2004	02.0
12/10/2004	01.5
12/11/2004	03.8
12/12/2004	00.8
12/13/2004	00.3
12/28/2004	02.0
12/29/2004	05.1
12/30/2004	00.8
12/31/2004	03.6